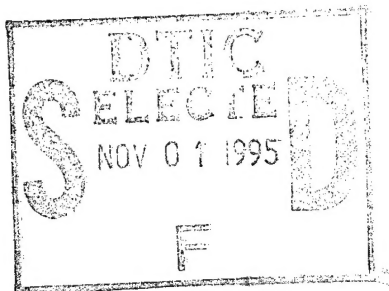


**FIELD EMITTER ARRAY BASED DICKE SWITCH ARRAY FOR MM-WAVE**



**RADIOMETRIC SYSTEMS**

**Contract No: N00014-94-C-0243**

**MONTHLY REPORT NO. 3**

**Period Ending December 1994**

**Prepared For**

**BALLISTIC MISSILE DEFENSE ORGANIZATION**

**OFFICE OF NAVAL RESEARCH**

**CODE 251A**

**BALLSTON TOWER ONE**

**800 NORTH QUINCY STREET**

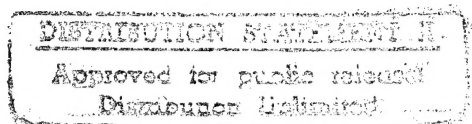
**ARLINGTON VA 22217-5660**

**Prepared By.**

**Princeton Microwave Technology Inc.**

**3564 Quakerbridge Road**

**Mercerville. NJ 08619**



*DTIC QUINCY STREET*

**19951031 035**

### TASK 1.3. Software Analysis of Array.

The preliminary analysis of the array has been completed. Based on this analysis an array has been designed and a prototype circuit is being readied. The array will be first tested statically so that its performance is documented for comparison later. In order to conduct the testing of the array, illumination and receiving horn antennas at 30 Ghz have been designed . Once the transmission characteristics of the array have been completed, the final array with the switches will be implemented to test the overall objective of the program.

### TASK 2.0 Fabrication

A preliminary design of the array has been completed. A prototype array has been layed out for fabrication in order to test its transmission characteristics. The Experiment will consist of the array illuminated by circular horn for the source and the energy will be received by a second circular horn, after it has passed through the array. The design of the horns have also been concluded and submitted for fabrication.

### Plans for next month:

During the next month the testing of the switch will be completed. It is expected to complete the testing of the switch array in its transmission mode.

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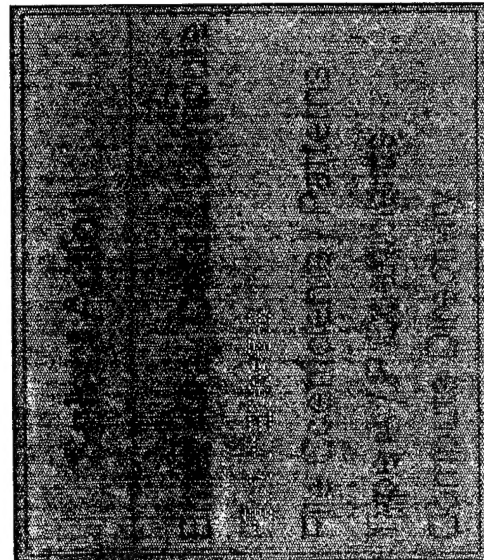
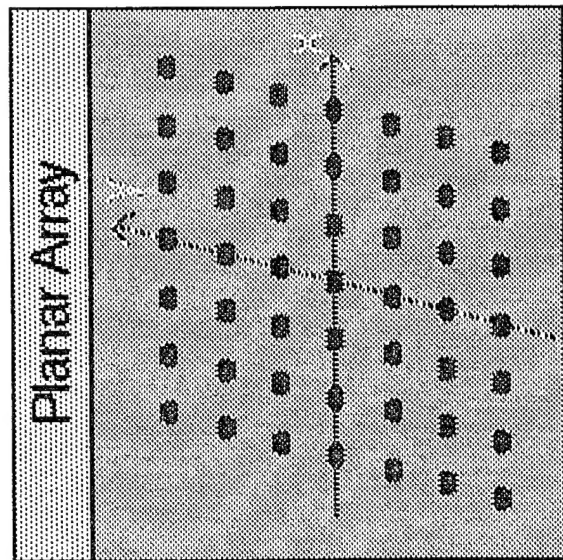
Figures 1 and 2 shown the specificatons of the planar array and its radiation pattern. Figures 3,4,5 and 6 detail the design parameters associated with the test horn antennas.

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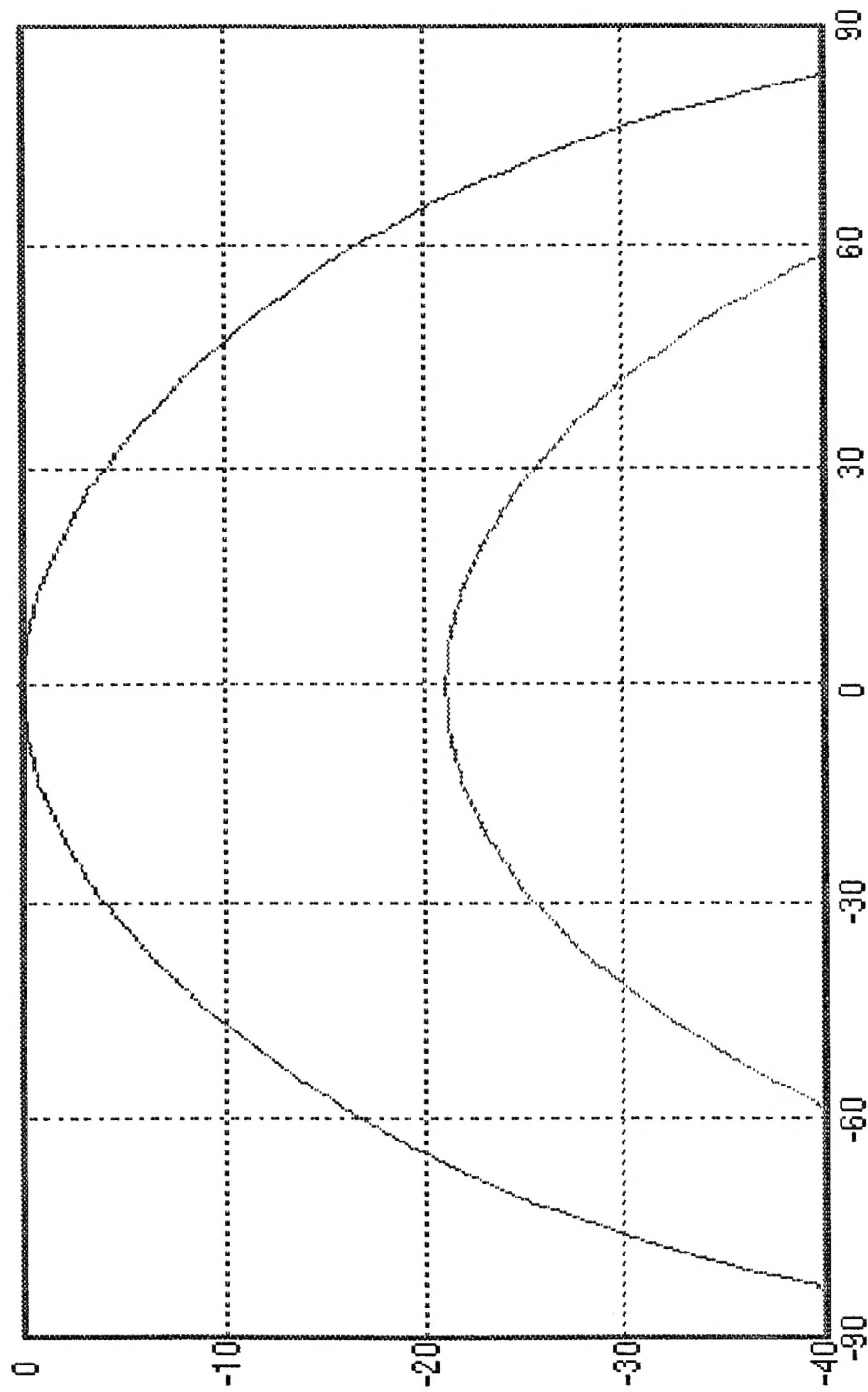


Array Specifications			
Number of elements	in x: 2	in y: 2	
Element spacing (cm)	in x: .5	in y: .5	
Operating frequency (GHz):	30		
Amplitude Distribution: Uniform			
Phase Distribution: Broadside Beam			
Phase shift in x:	0.0	in y:	0.0
Scan angle:	0=	0.0	0= 0.0 deg.
Element type: Rectangular Patch			
Polarization of elements: (X/Y)? X			
Resonant length (cm): .3			
Patch width (cm): .3			
Pattern cut: 0 (deg)= 5			
Pattern increment (deg): 1			

Use ↑ and Enter for menus;

Esc to backup or quit

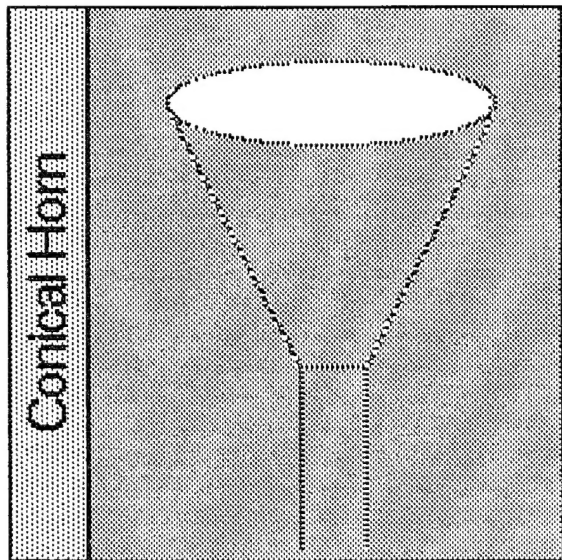
FIGURE 1: 2 x 2 ARRAY AT 30 GHz



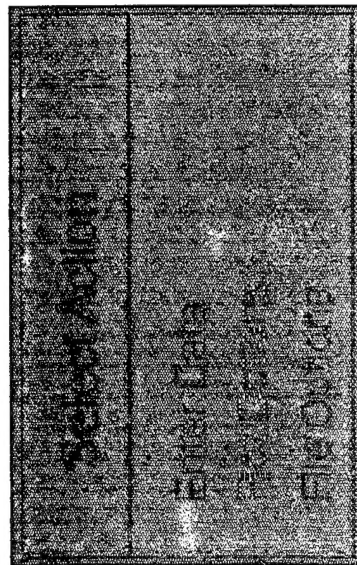
Use  $\leftrightarrow$  to move cursor  
 PrtSc for EGAD  
 Esc to quit

E-theta = 0.00 dB  
 E-phi = -21.16 dB  
 at Theta= 0.0 deg.

FIGURE 2: Pattern Associated  
 with Figure 1



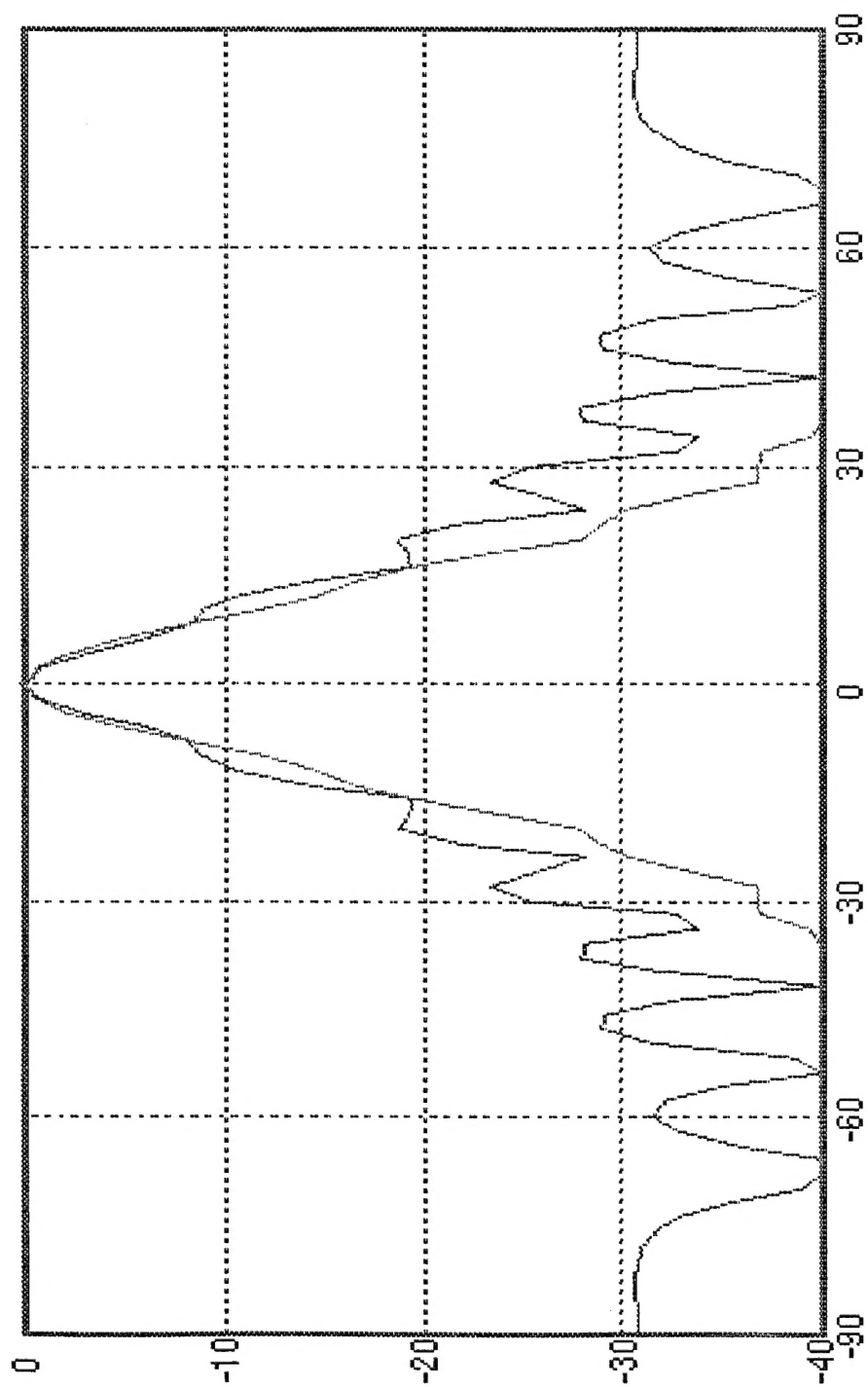
Input Data
Enter the frequency (GHz): 30
Enter aperture radius (cm): 3.9
Enter axial horn length (to apex)(cm): 20
Enter pattern increment (deg): 2



Horn Characteristics
Maximum phase error is 136.9°
Optimum aperture radius is 3.9 cm
The directivity is 24.8 dB

Use ↑ and Enter for menus;      Esc to backup or quit

Figure 3: Illuminating Horn at 30 GHz



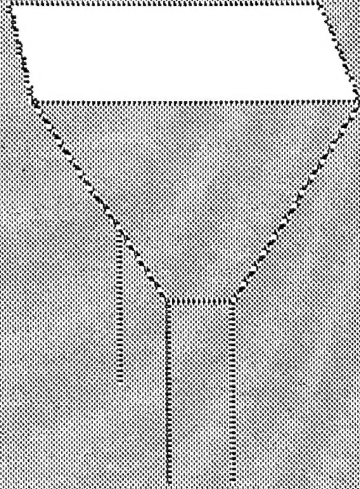
Use  $\leftrightarrow$  to move cursor  
 PrtSc for EGAD  
 Esc to quit

E-plane = 0.00 dB  
 H-plane = 0.00 dB  
 at Theta= 0.0 deg.

Figure 4: Pattern of illuminating Conical Horn



## E-plane Sectoral Horn



## Input Data

Enter the frequency (GHz): 30  
Enter E-plane aperture dimension (cm): 6  
Enter H-plane aperture dimension (cm): 6  
Enter axial horn length (to apex)(cm): 20  
Enter pattern increment (deg): 2

## Plot Options

Plot type (P/R): R

## Horn Characteristics

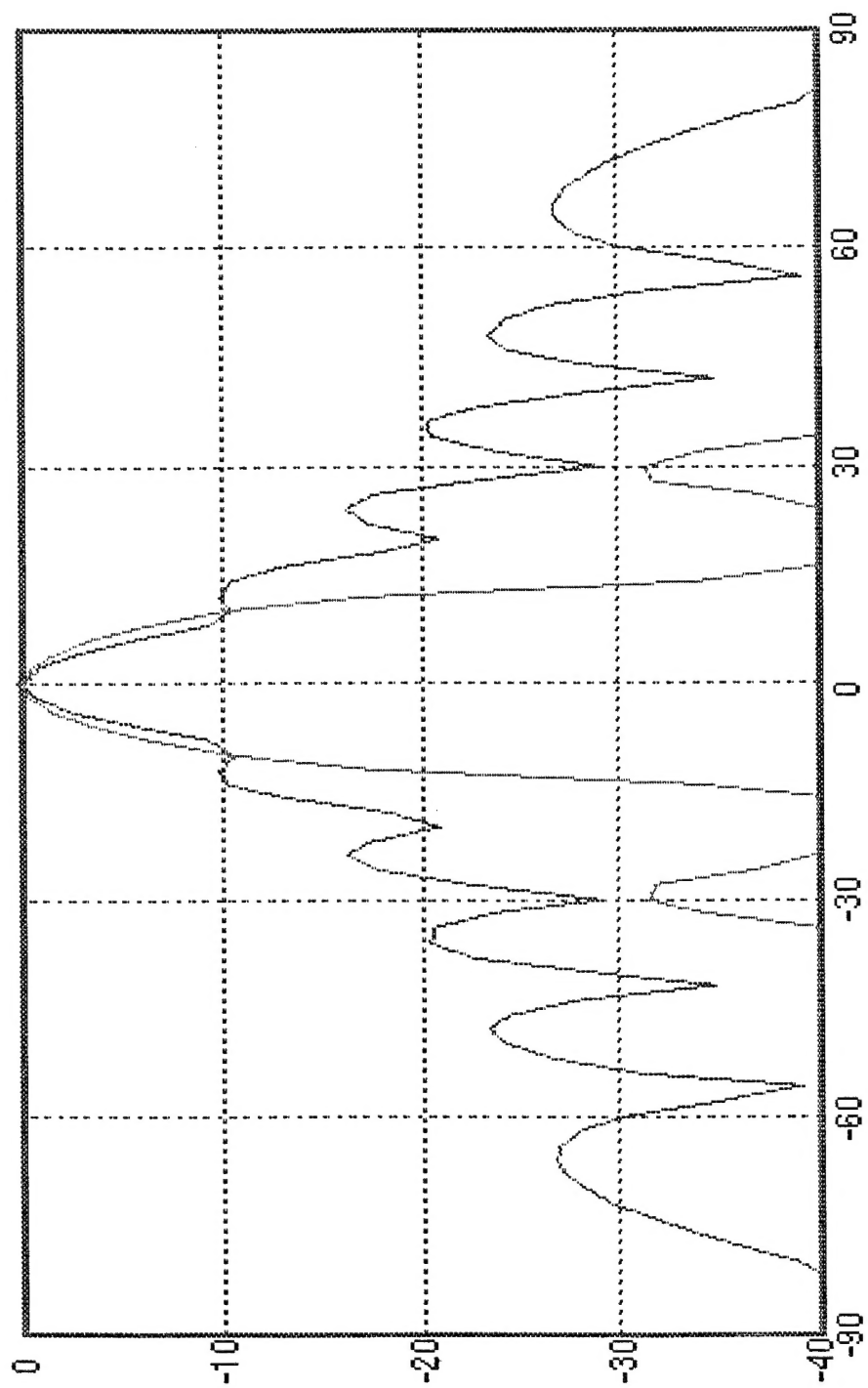
Maximum phase error is 81.0°  
Optimum E-plane dimension is 6.3 cm  
The directivity is 24.9 dB

Use ↑ and Enter for menus:

Esc to backup or quit

Figure 5: illuminating  
Horn at 30 GHz





Use  $\leftarrow$  to move cursor  
 PrtSc for EGAD  
 Esc to quit

E-plane = 0.00 dB  
 H-plane = 0.00 dB  
 at Theta= 0.0 deg.

Figure 6: Pattern of Rectangular illuminating  
 Horn at 30 GHz.



OFFICE OF THE UNDER SECRETARY OF DEFENSE (ACQUISITION)  
DEFENSE TECHNICAL INFORMATION CENTER  
CAMERON STATION  
ALEXANDRIA, VIRGINIA 22304-6145

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REFER TO

DTIC-OCC

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TO:

OFFICE OF NAVAL RESEARCH  
CORPORATE PROGRAMS DIVISION  
ONR 353  
800 NORTH QUINCY STREET  
ARLINGTON, VA 22217-5660

1. Reference: DoD Directive 5230.24, Distribution Statements on Technical Documents, 18 Mar 87.

2. The Defense Technical Information Center received the enclosed report (referenced below) which is not marked in accordance with the above reference.

MONTHLY REPORT #3  
N00014-94-C-0243  
TITLE: FIELD EMITTER ARRAY  
BASED DICKE SWITCH ARRAY FOR  
MM-WAVE

3. We request the appropriate distribution statement be assigned and the report returned to DTIC within 5 working days.

4. Approved distribution statements are listed on the reverse of this letter. If you have any questions regarding these statements, call DTIC's Cataloging Branch, (703) 274-6837.

FOR THE ADMINISTRATOR:

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GOPALAKRISHNAN NAIR  
Chief, Cataloging Branch

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ARLINGTON, VA 22217-5660

\_\_\_\_\_  
(Controlling DoD Office Name)

\_\_\_\_\_  
(Reason)

DEBRA T. HUGHES  
DEPUTY DIRECTOR  
CORPORATE PROGRAMS OFFICE

\_\_\_\_\_  
(Controlling DoD Office Address,  
City, State, Zip)

Debra T. Hughes  
(Signature & Typed Name)

\_\_\_\_\_  
(Assigning Office)

19 SEP 1995

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(Date Statement Assigned)